



DOE-EM/GJ1022-2005

## 299-E26-54 (A6647) Log Data Report

### Borehole Information:

<b>Borehole:</b> 299-E26-54 (A6647)			<b>Site:</b> 216-A-24 Crib			
<b>Coordinates (WA St Plane)</b>		<b>GWL<sup>1</sup> (ft):</b> None		<b>GWL Date:</b> 09/13/05		
<b>North (m)</b>	<b>East (m)</b>	<b>Drill Date</b>	<b>Ground Level Elevation (ft)</b>	<b>Total Depth (ft)</b>	<b>Type</b>	
136394.851	575735.395	09/81	650.82	42	Cable	

### Casing Information:

<b>Casing Type</b>	<b>Stickup (ft)</b>	<b>Outer Diameter (in.)</b>	<b>Inside Diameter (in.)</b>	<b>Thickness (in.)</b>	<b>Top (ft)</b>	<b>Bottom (ft)</b>
Welded Steel	4.35	6 5/8	6 1/8	1/4	4.35	42

### Borehole Notes:

Casing diameter and casing stickup measurements were acquired by the logging engineer using a caliper and steel tape. Measurements were rounded to the nearest 1/16 in.

### Logging Equipment Information:

<b>Logging System:</b> Gamma 1E		<b>Type:</b> SGLS (70%) SN: 34TP40587A
<b>Effective Calibration Date:</b> 03/04/05	<b>Calibration Reference:</b> DOE/EM-GJ854-2005	
<b>Logging Procedure:</b> MAC-HGLP 1.6.5, Rev. 0		

### Spectral Gamma Logging System (SGLS) Log Run Information:

<b>Log Run</b>	<b>1</b>	<b>2 Repeat</b>			
Date	09/28/05	09/28/05			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	41.5	27.5			
Finish Depth (ft)	4.5	21.5			
Count Time (sec)	100	100			
Live/Real	R	R			
Shield (Y/N)	N	N			
MSA Interval (ft)	1.0	1.0			
ft/min	N/A <sup>2</sup>	N/A			
Pre-Verification	AE117CAB	AE117CAB			
Start File	AE118000	AE118038			
Finish File	AE118037	AE118044			
Post-Verification	AE118CAA	AE118CAA			
Depth Return Error (in.)	0	0			

<b>Log Run</b>	<b>1</b>	<b>2 Repeat</b>			
Comments	No fine gain adjustment.	No fine gain adjustment.			

### **Logging Operation Notes:**

Logging was conducted with a centralizer on the sonde. Logging data acquisition is referenced to the top of casing. A repeat section was collected in this borehole to evaluate system performance.

### **Analysis Notes:**

<b>Analyst:</b>	Henwood	<b>Date:</b>	10/25/05	<b>Reference:</b>	GJO-HGLP 1.6.3, Rev. 0
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Pre-run and post-run verifications for the logging system were performed before and after the day's data acquisition. The acceptance criteria were met.

A casing correction for 0.25-in.-thick casing was applied to the log data.

SGLS spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with an EXCEL worksheet template identified as G1EMar05.xls using efficiency functions and corrections for casing, water, and dead time as determined from annual calibrations. No corrections for water were necessary.

### **Log Plot Notes:**

Separate log plots are provided for the man-made radionuclide ( $^{137}\text{Cs}$ ) detected in the borehole, naturally occurring radionuclides ( $^{40}\text{K}$ ,  $^{238}\text{U}$ ,  $^{232}\text{Th}$  [KUT]), a combination of man-made, KUT, and dead time, and total gamma plotted with dead time. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, casing corrections, or water corrections. A plot of shape factor (SF2\*) that suggests the possibility of  $^{90}\text{Sr}$  contamination is also included.

A comparison plot of the Westinghouse Hanford Company Radionuclide Logging System (RLS) data acquired in 1994 with the current SGLS data is provided.

### **Results and Interpretations:**

$^{137}\text{Cs}$  was the man-made radionuclide detected in this borehole.  $^{137}\text{Cs}$  was detected from the ground surface (4.35 ft when casing stickup is applied) to 19.5 ft, from 22.5 to 24.5 ft, and at 28.5 ft. The maximum concentration was measured at approximately 2 pCi/g at 23.5 ft.

The total gamma activity from 23 to 28 ft appears high relative to expected contributions from the naturally occurring radionuclides (KUT) and a  $^{137}\text{Cs}$  concentration of only 2 pCi/g. Therefore, a limited shape factor analysis was performed to detect the presence of bremsstrahlung radiation associated with beta decay of  $^{90}\text{Sr}$ . Previous experience with a borehole in the 241-B Tank Farm indicated that variations in SF2\* may be diagnostic of  $^{90}\text{Sr}$  concentrations above approximately 500 pCi/g (McCain and Koizumi 2002). SF2\* is defined as the ratio between total counts in the 60 to 350 keV range divided by total counts in the 350 to 650 keV range. In the absence of other interfering contaminants, SF2\* typically assumes a value between 3.3 and 3.7, and increases to values greater than 6 in intervals with elevated  $^{90}\text{Sr}$  concentrations. For  $^{90}\text{Sr}$  concentrations between 500 and 1000 pCi/g, SF2\* values are transitional between 3.7 and 6. In this borehole, SF2\* varied from 3.2 to a maximum of 5.7 at the 24.5-ft depth. It is estimated the maximum

concentration of  $^{90}\text{Sr}$  exceeds 500 pCi/g. Further quantification is not possible because the analysis by McCain and Koizumi was conducted using a 0.514-in.-thick casing and this borehole has a 0.25-in.-thick casing. The effect of casing thickness on generation and transmission of bremsstrahlung gamma rays is unknown.

The comparisons of SGLS and RLS  $^{137}\text{Cs}$  concentrations show good agreement after correcting for decay, indicating no significant changes have occurred since 1994.

The repeat sections indicate good agreement of the naturally occurring KUT and  $^{137}\text{Cs}$  concentrations.

### **References:**

McCain, R.G. and C. J. Koizumi, 2002. *Correlation of Spectral Gamma Log Response and Sr-90 Concentrations for a Steel-Cased Borehole*; GJO-2002-322-TAR; prepared by MACTEC ERS for the Grand Junction Office, Grand Junction, Colorado.

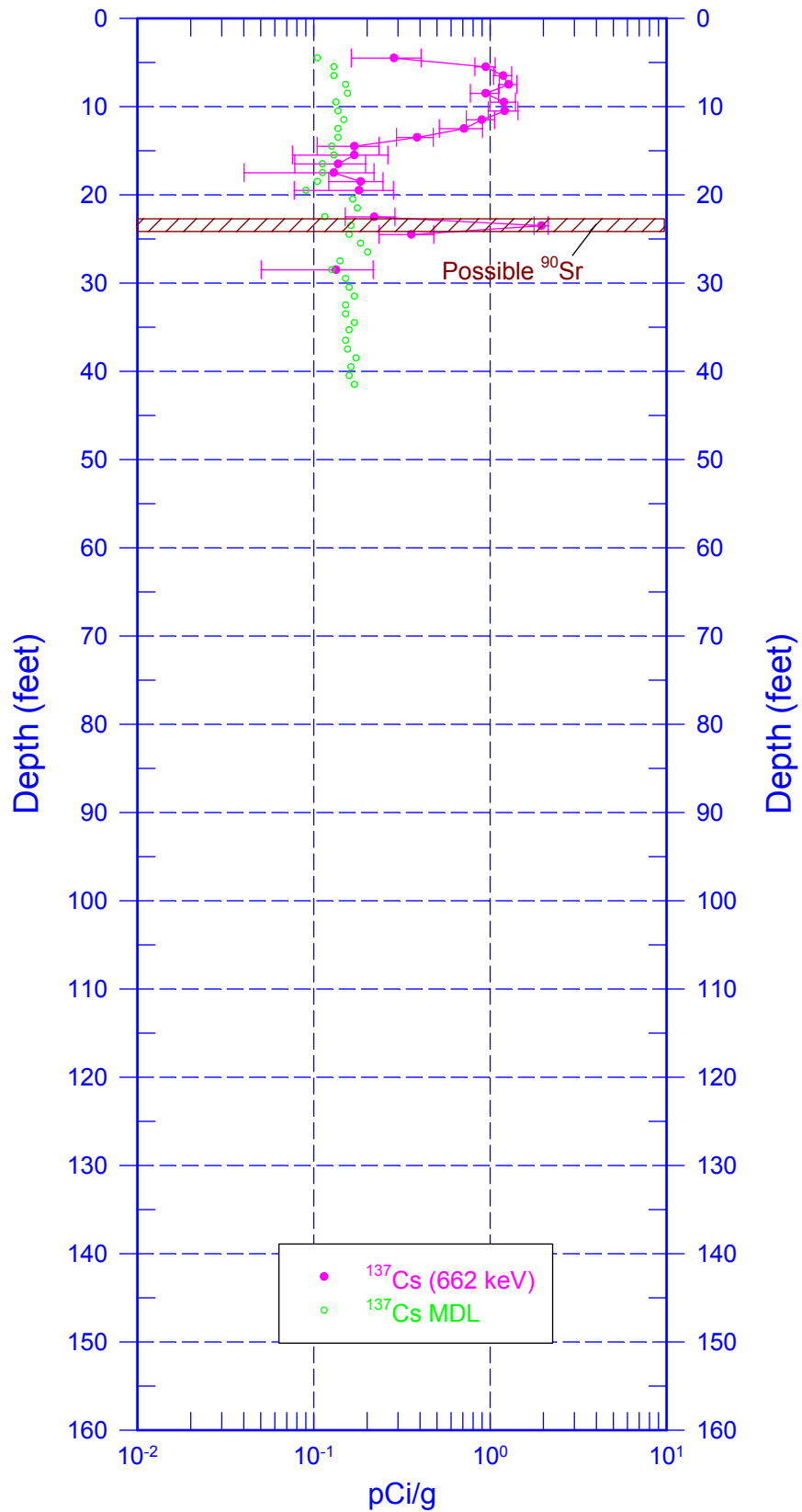
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<sup>1</sup> GWL – groundwater level

<sup>2</sup> N/A – not applicable

# 299-E26-54 (A6647)

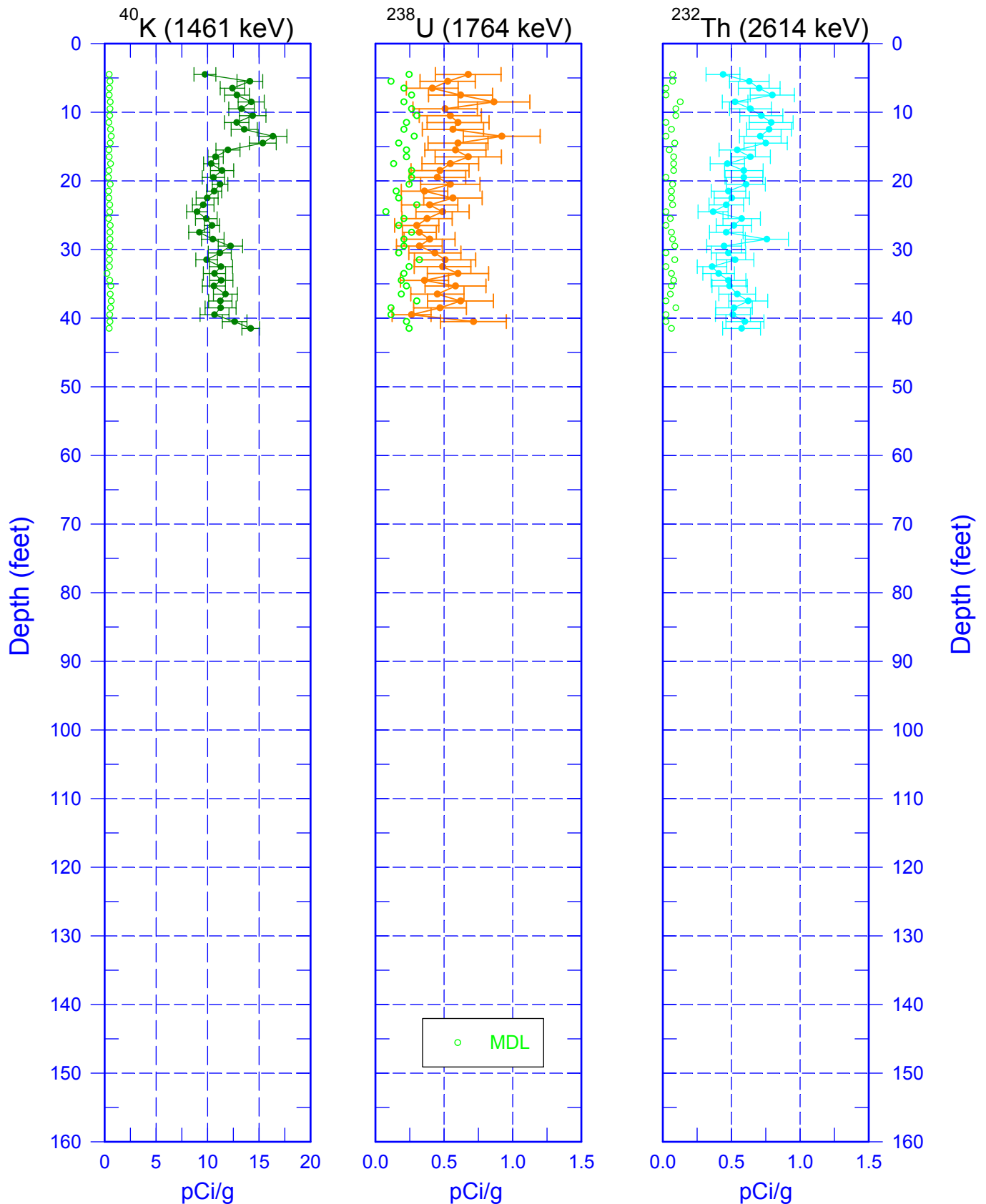
## Man-Made Radionuclides



Zero Reference - Top of Casing

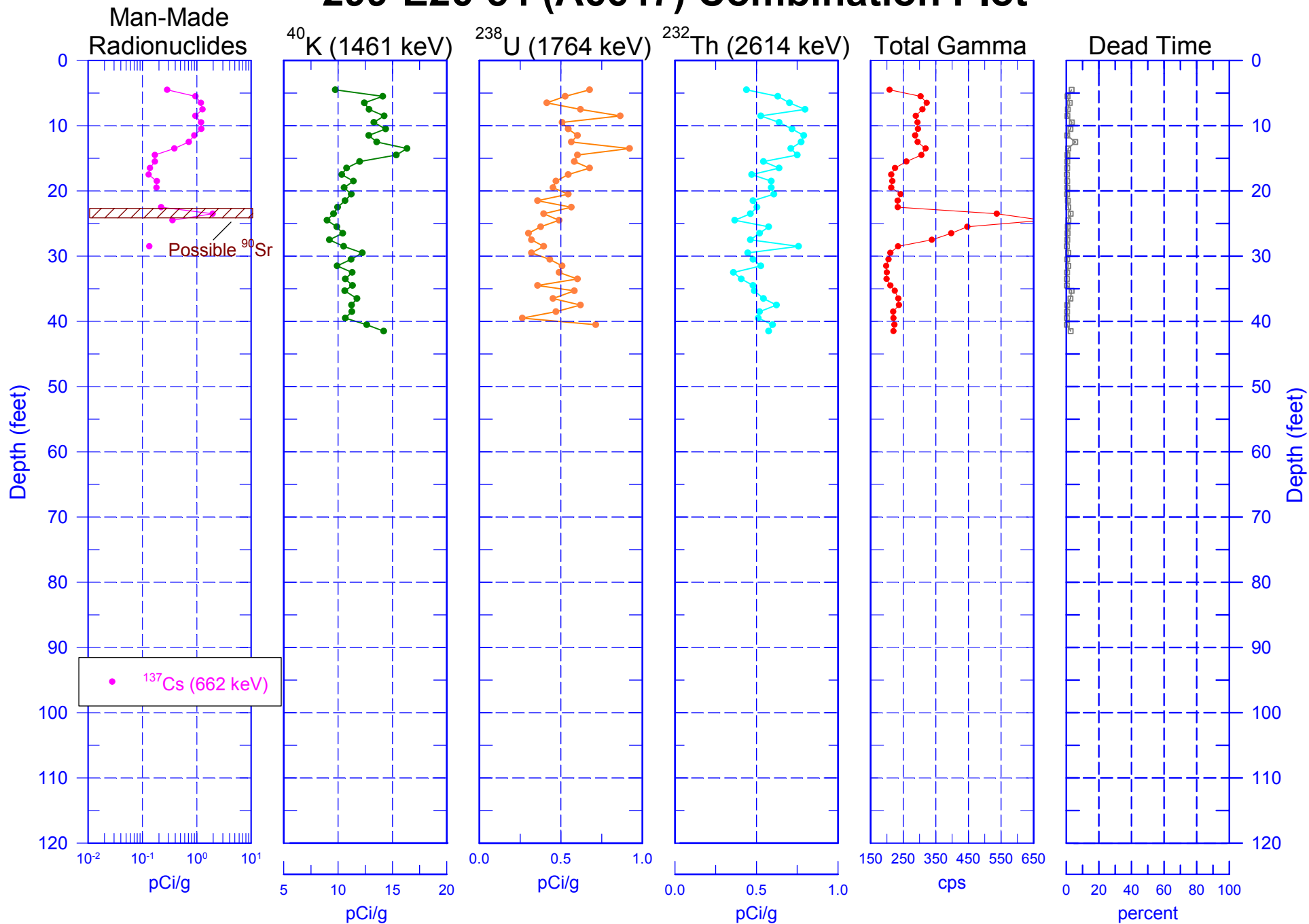
# 299-E26-54 (A6647)

## Natural Gamma Logs



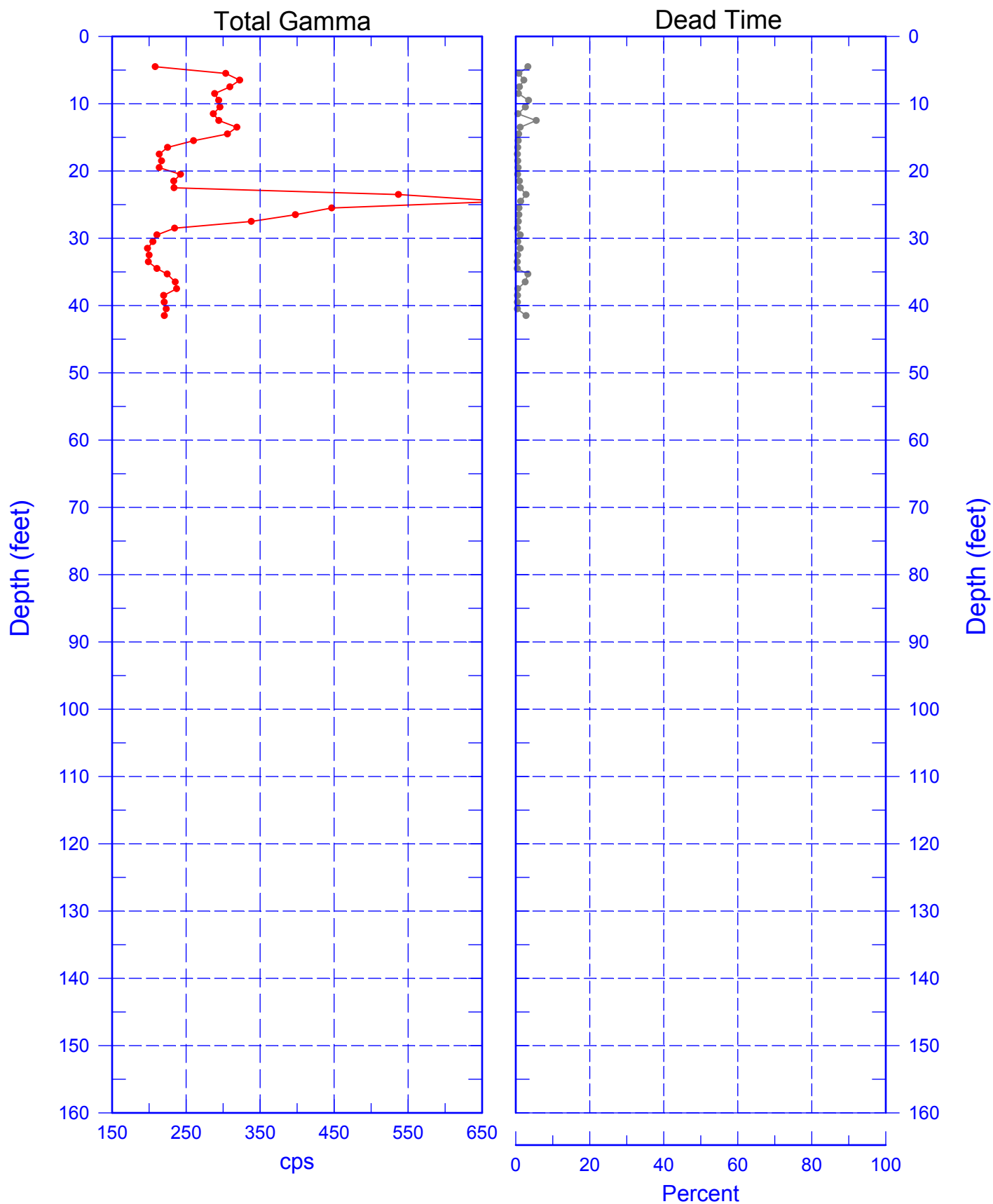
Zero Reference = Top of Casing

# 299-E26-54 (A6647) Combination Plot



# 299-E26-54 (A6647)

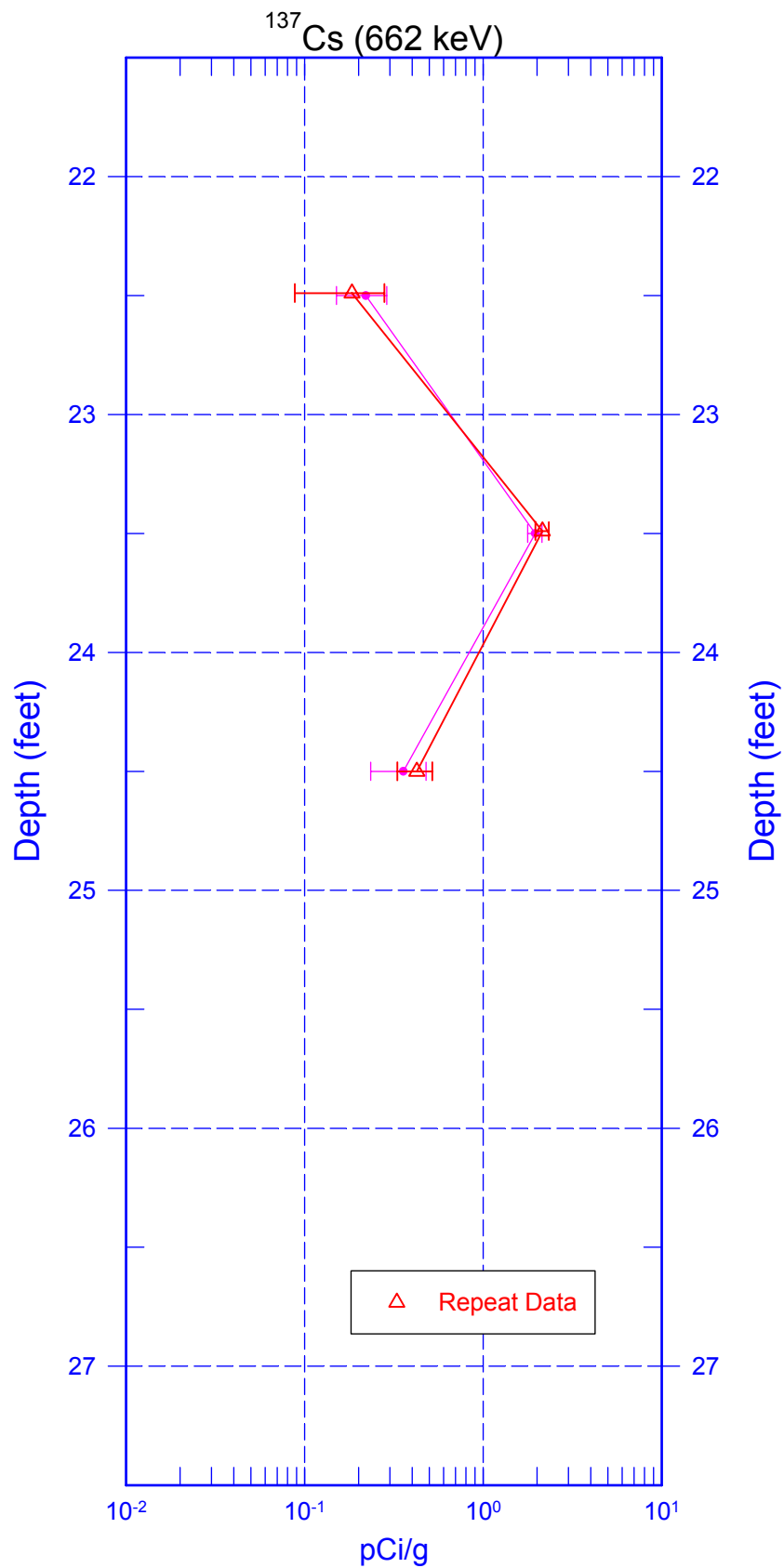
## Total Gamma & Dead Time



Reference - Top of Casing

# 299-E26-54 (A6647)

## Repeat of Man-Made Radionuclides

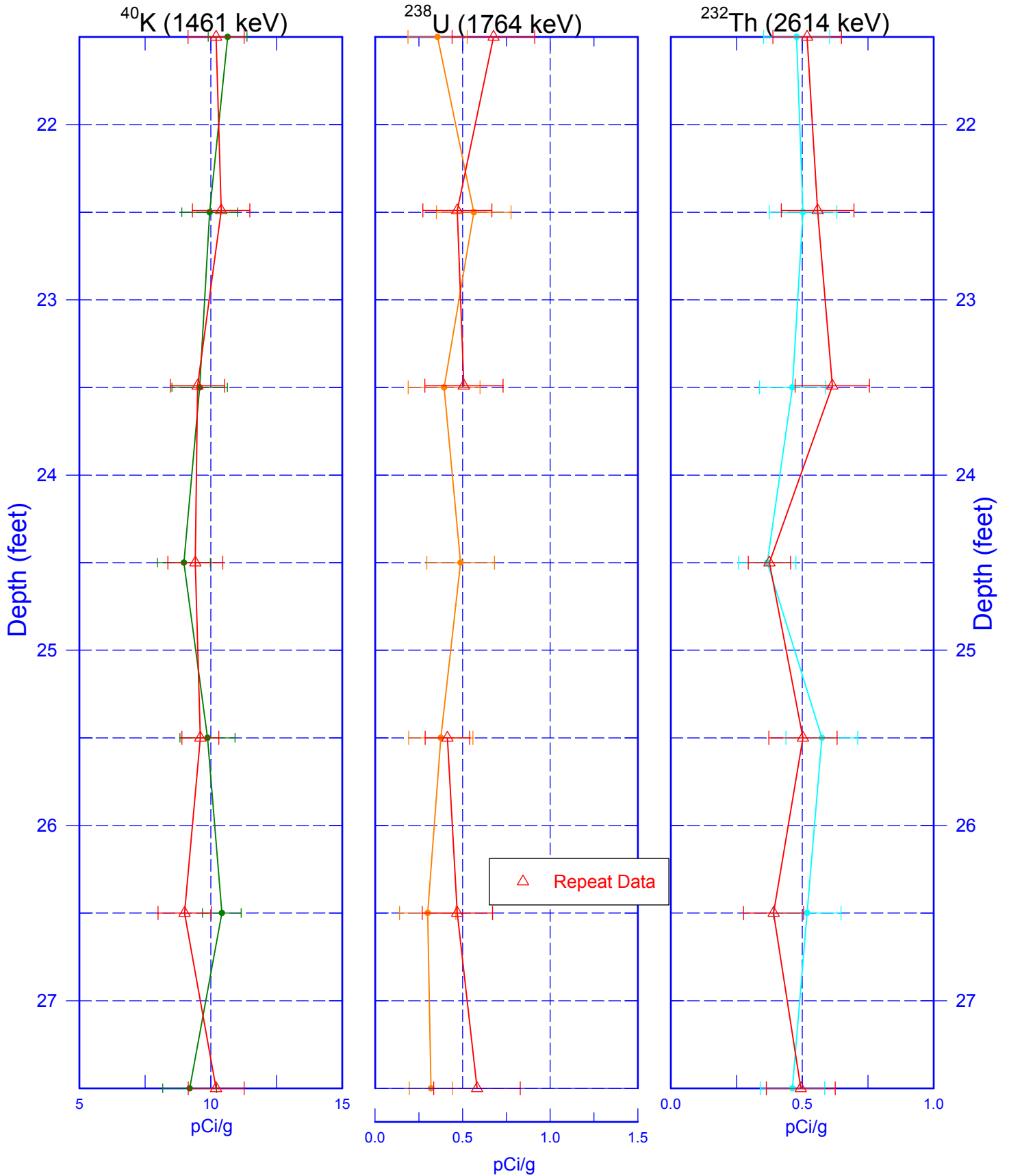


Zero Reference - Top of Casing



# 299-E26-54 (A6647)

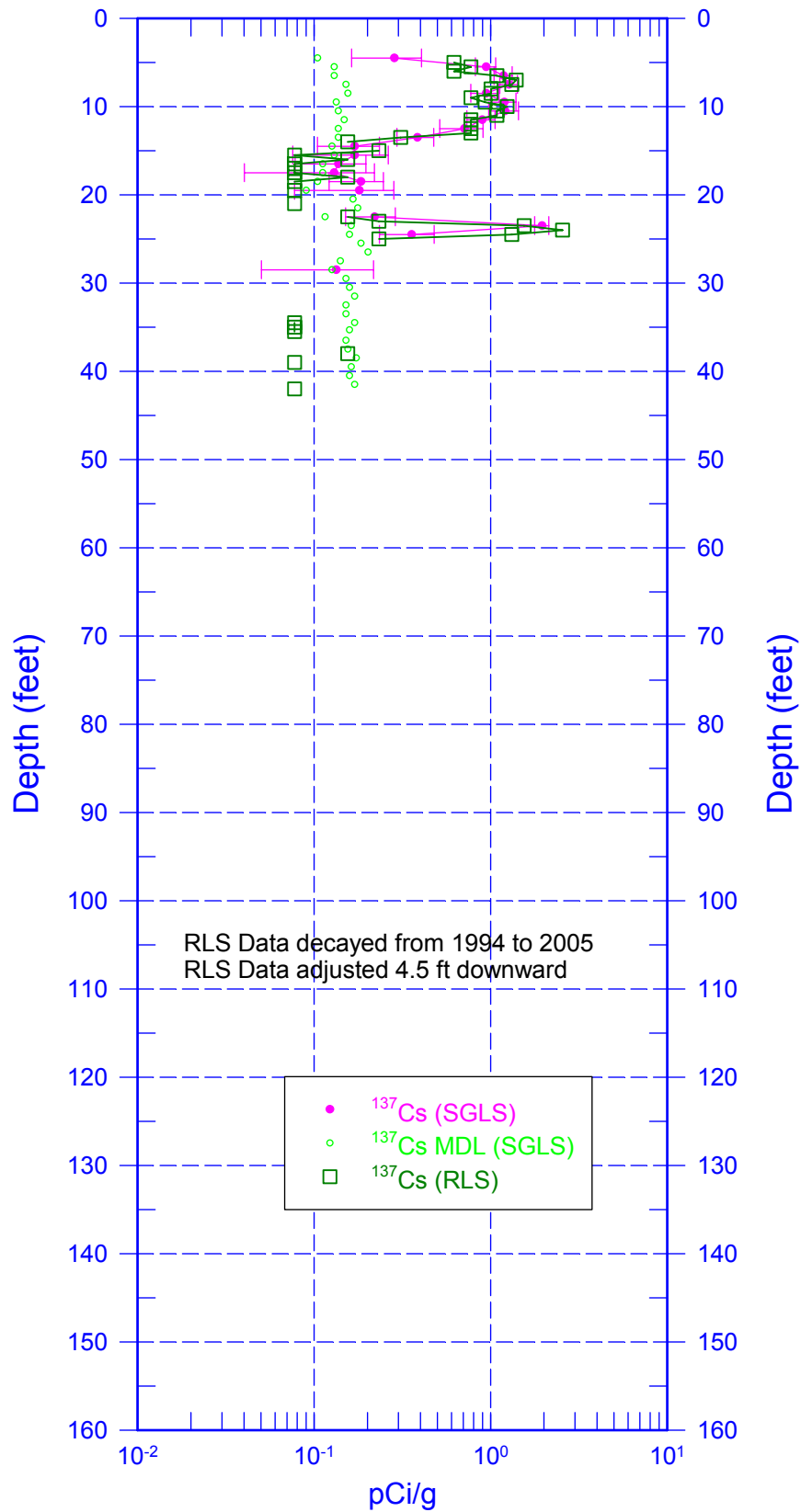
## Repeat Section of Natural Gamma Logs



Zero Reference - Top of Casing

# 299-E26-54 (A6647)

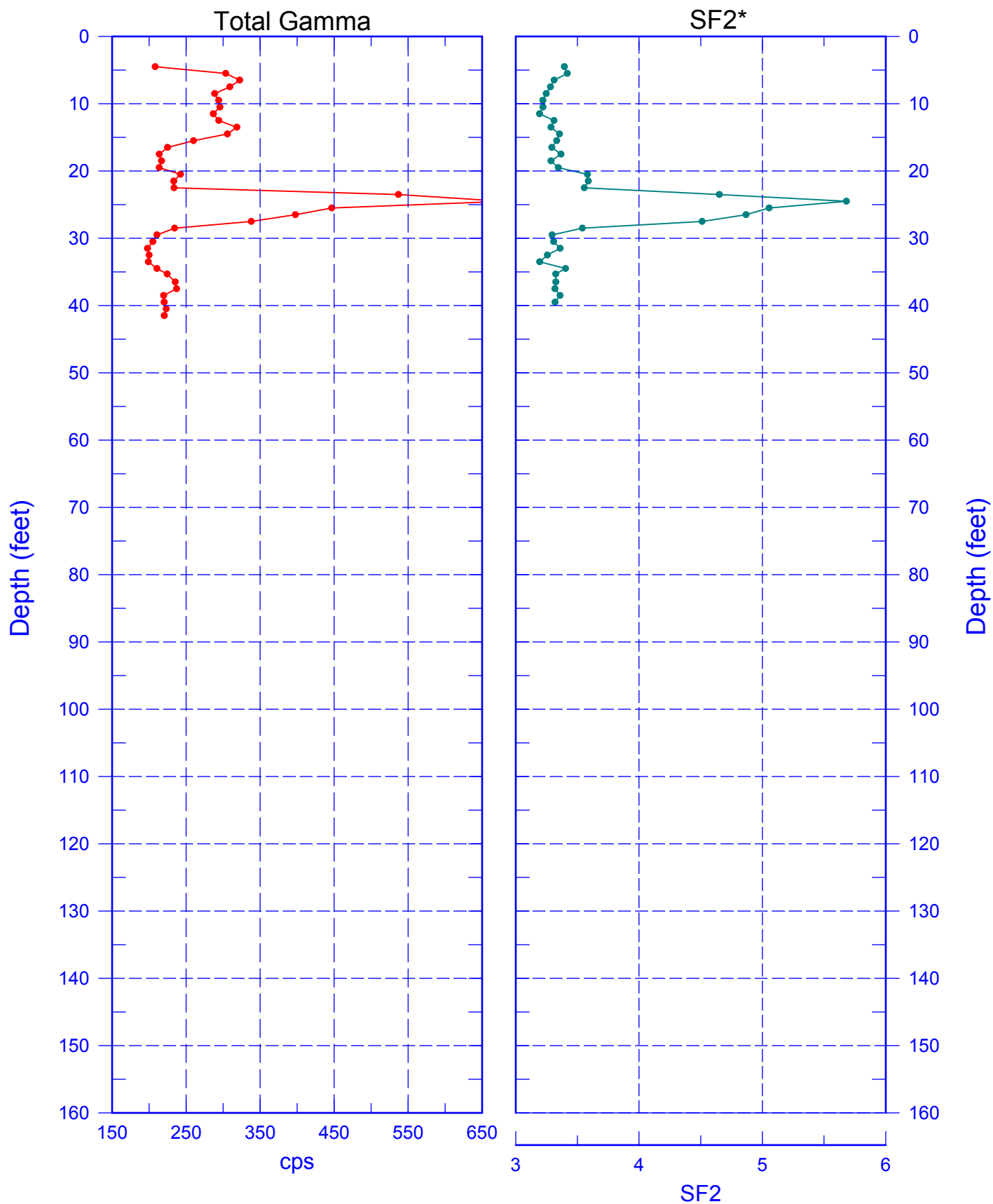
## Comparison of SGLS and RLS Data



Zero Reference - Top of Casing

# 299-E26-54 (A6647)

## Shape Factor (60-350 keV)/(350-650 keV)



Reference - Top of Casing